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or the locus of $\alpha'\beta'\gamma'$ is

$$\alpha(\beta^2 - \gamma^2)(\cos A - \cos B \cos C) + \beta(\gamma^2 - \alpha^2)(\cos B - \cos C \cos A) + \gamma(\alpha^2 - \beta^2)(\cos C - \cos A \cos B) = 0. \dots (1)$$

This equation represents a cubic which passes through the vertices of the triangle and cuts the sides α, β, γ again at their respective intersections with

$$\begin{aligned}\beta(\cos C + \cos A \cos B) &= \gamma(\cos B + \cos C \cos A), \\ \gamma(\cos A + \cos B \cos C) &= \alpha(\cos C + \cos A \cos B), \\ \alpha(\cos B + \cos C \cos A) &= \beta(\cos A + \cos B \cos C).\end{aligned}$$

The equation (1) is satisfied by the coordinates $1, 1, 1; \cos A, \cos B, \cos C$; and $\cos B \cos C, \cos C \cos A, \cos A \cos B$; hence the curve passes through the centres of the inscribed and circumscribed circles and through the orthogonal centre of the triangle.

If $A = B$, (1) becomes

$$(\alpha - \beta)[c(\gamma^2 + \alpha\beta) - a(\alpha\gamma + \beta\gamma)] = 0.$$

$\alpha - \beta$ is the bisector of the angle C and, on applying the criterion (Todhunter's Conic Sections, p. 306),

$$c(\gamma^2 + \alpha\beta) - a(\alpha\gamma + \beta\gamma) = 0$$

is found to be an hyperbola. One branch passes through A and the middle point of AC , the other, through B and the middle point of BC . Its transverse axis is parallel to AB . If $A = B = C$, (1) becomes

$$(\alpha - \beta)(\beta - \gamma)(\gamma - \alpha) = 0,$$

the bisectors of the angles of the triangle.

NOTE BY ARTEMAS MARTIN. — There is an omission in my solution of problem 139, p. 29, Vol. IV. In the first line the coefficients $1 + c^2$ and $1 - c^2$ should be divided by c^2 . In the third line write $(2c^2 - 1) \div c^2$ for $(2 - c^2)$ and $(1 - c^2) \div c^2$ for $(1 - c^2)$.

The corrected result is

$$A = \frac{4\pi a^3}{3ceS} \left[ce(1 - e^2)^{\frac{1}{2}} + \left(\frac{2c^2 - 1}{c^2} \right) [E'(e)] + \left(\frac{1 - c^2}{c^2} \right) [F'(e)] \right].$$

QUERY, BY PROF. A. HALL. — The approximate value of the definite integral

$$\int_0^{\frac{\pi}{2}} \sqrt{\sin \varphi} \cdot d\varphi$$

is 1.198..... Is there a convenient way of computing this numerical value?